



November 8, 2011

Mr. John Cook
Kansas Department of Health and Environment
Bureau of Environmental Remediation
Curtis State Office Building
1000 SW Jackson Street, Ste. 410
Topeka, KS 66612-1367

FINAL

RECEIVED

NOV 21 2011

BUREAU OF
ENVIRONMENTAL REMEDIATION

Re: Groundwater Arsenic Issue
Former MGP Site Concordia, Kansas
Consent Order 94-E-0172
Burns & McDonnell Project 58901

BER SCANNED

MAY 23 2012

Dear Mr. Cook:

The purpose of this letter is to update KDHE relative to the issue of arsenic in groundwater at one location at the referenced MGP site. In response to KDHE's letter dated April 6, 2011, ONEOK provided an approach to evaluating arsenic background levels in groundwater (letter dated June 13, 2011). KDHE approved implementation of this approach in an email dated June 22, 2011. This letter presents description and discussion of work completed by Burns & McDonnell on behalf of ONEOK to provide necessary information to KDHE to achieve closure of the Concordia MGP site. The remainder of this letter presents the following:

- Discussion of background groundwater sampling and analysis activities,
- Description of the statistical evaluation completed on analytical results,
- Discussion of arsenic in soil and groundwater at MGP sites,
- Evaluation of groundwater gradient and flow direction at the site, and
- Summary of site groundwater conditions.

GROUNDWATER SAMPLING SUMMARY

ONEOK installed five groundwater monitoring wells at the site after completion of site soil remediation. Three of these five wells (CMW-03, CMW-04 and CMW-05) are located outside of the footprint of the historic MGP facilities and activities. These wells were sampled four times and analyzed for typical MGP related constituents, including VOCs, PAHs, metals and cyanide. Results of these sampling and analysis activities were submitted to KDHE in a letter report dated February 3, 2011. At the time of the last sampling and analysis event the only constituent which exceeded Residential and Non-Residential Groundwater RSK criteria was arsenic. This occurred at monitoring well CMW-05 at a level of 0.021 mg/L. ONEOK believes that this is not related to former MGP activities but is either naturally occurring or possibly related to widespread use of pesticides, herbicides, and insecticides in the area.

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After discussions and correspondence between KDHE and ONEOK, a letter proposal to sample and analyze background groundwater was submitted to KDHE (letter dated June 13, 2011). KDHE subsequently approved the proposal in an email dated June 22, 2011 and ONEOK completed these field activities on August 9, 2011.

ONEOK collected eleven groundwater samples from locations within Concordia city street rights-of-way. A geoprobe was used to drive a small diameter hole to a depth of approximately four to five feet below the water table, approximately 25 feet below grade and a peristaltic pump was used to slow purge a small amount of water from the hole to insure that the hole is sufficiently below the water table to collect a representative sample. Dedicated tubing was used for each sample collected. Most samples were collected from depths of 24 to 29 feet below ground surface (bgs); however, at one location samples were collected from approximately 39 feet bgs. All samples were field filtered and analyzed for arsenic and dissolved iron.

Sample locations were not surveyed; however, approximate sampling locations are shown on the attached figure (Figure 1). For purposes of utility clearance sample numbers were identified by the following street addresses:

- 116 Washington St. – CBG-01 and CBG-02
- 221 East 2nd St. – CBG-03 and CBG-04
- 236 West 2nd St. – CBG-05 and CBG-06
- 511 West 3rd St. – CBG-07 and CBG-08
- 322 West 5th St. – CBG-09
- 408 East 5th St – CBG-10 and CBG-11

It is noted that samples were collected in the general vicinity of these addresses and two samples were generally collected from each general location. Many of these locations were very slow to purge due to significant levels of silt and in some cases two or three inline filters were used in order to obtain a sufficient sample volume.

ONEOK's proposal included the re-sampling of monitoring well CMW-05; however, this well could not be sampled due to materials stored over the well by the site owner. This well is located within the City of Concordia street right-of-way and may have been destroyed by the site owner's ongoing commercial activities.

Samples were shipped to Environmental Science Corporation (ESC) of Nashville, Tennessee for analysis of arsenic using USEPA Method 6020. Analytical results for arsenic ranged from 0.0020mg/L (CBG-05) to 0.0062mg/L (CBG-04). Results for individual samples are as follows:

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- CBG-01 – 0.0037 mg/L
- CBG-02 – 0.0048 mg/L
- CBG-03 – 0.0031 mg/L
- CBG-04 – 0.0062 mg/L
- CBG-05 – 0.0020 mg/L
- CBG-06 – 0.0030 mg/L
- CBG-07 – 0.0034 mg/L
- CBG-08 – 0.0023 mg/L
- CBG-09 – 0.0021 mg/L
- CBG-10 – 0.0032 mg/L
- CBG-11 – 0.0059 mg/L

The complete laboratory data report is included as Attachment A.

STATISTICAL EVALUATION

The following paragraphs describe the methodology, data used, and calculations performed to determine the tolerance limit for arsenic in groundwater at the Concordia MGP site.

A tolerance limit is a concentration range designed to contain a pre-specified proportion of the underlying population from which the statistical sample is drawn (e.g., 95 percent of all possible population measurements). Since the interval is constructed from random sample data, a tolerance interval is expected to contain the specified population proportion only with a certain level of statistical confidence. Two coefficients are thus associated with any tolerance interval. One is the population proportion that the interval is supposed to contain, called the coverage (γ). The second is the degree of confidence with which the interval reaches the specified coverage. This is sometimes known as the tolerance coefficient or more simply, the confidence interval ($1-\alpha$). A tolerance interval with 95% coverage and a tolerance coefficient of 90% is constructed to contain, on average, 95% of the distribution of all possible population measurements with a confidence probability of 90%.

To determine that a compliance point population is identical to that of background, an upper tolerance limit with high coverage (γ) can be constructed on the sample background data. Coverage of 95% is usually recommended. In this case, random observations from a distribution identical to background should exceed the upper tolerance limit less than 5% of the time. Similarly, a tolerance coefficient or confidence level of at least 95% is recommended. This gives 95% confidence that the (upper) tolerance limit will contain at least 95% of the distribution of observations in background or in any distribution similar to background.

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Once the limit is constructed on background, each compliance point observation is compared to the upper tolerance limit. If any compliance point measurement exceeds the limit, the well from which it was drawn is flagged as showing a significant increase over background.

Standard parametric tolerance limits assume normality of the sample background data used to construct the limit. One compliance point observation from each distinct well is compared against the tolerance limit during each statistical evaluation. The compliance point measurements are assumed to follow the same distribution as background.

The method used to calculate the tolerance limit for arsenic in groundwater was taken from the United States Environmental Protection Agency's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance, EPA 530-R-09-007* (USEPA, 2009) Equation 17.16, and is shown on Table 1.

The mean and standard deviation for arsenic in groundwater at Concordia were calculated using the results for samples collected on August 9, 2011 from sample locations CBG-01 through CBG-11 (see above). The term $k(n, \gamma, 1 - \alpha)$ was taken from Table 17-3 from Appendix D of USEPA, 2009, assuming 95% confidence and coverage with a sample size (n) of 11. This resulted in a value of 2.815. The calculated 95% tolerance limit for arsenic in groundwater at the Site is 0.0075mg/L and the calculated 99% tolerance limit for arsenic in groundwater at the site is 0.0106mg/L.

ARSENIC IN SOIL AND GROUNDWATER AT MGP SITES

It is generally accepted that trace metals found at MGP sites are sometimes a reflection of metals found in coal feedstock. According to GRI (*Management of manufactured Gas Plant Sites, Vol. I*) "The actual presence and distribution of trace metals at an MGP site is so dependent upon the MGP feedstock that any generalization of what might be present at a site is not possible without specific process and site information."

Research into the potential source of coal used to produce gas at Concordia did not yield any helpful information nor did research into the results of historical analysis of metals in coal. Most historical references address only total ash content with little information on metal content of the ash. While some historical references identify some specific metals (i.e. manganese and magnesium) no historical reference to arsenic was identified. GRI (see above) reports the range in arsenic concentrations for U.S. coals is 0.5mg/kg to 106 mg/kg. An EPRI study published in 1999 (*Survey of Physical and Chemical Properties of Soils Collected from Former Manufactured Gas Plant Sites*) reported a "typical background concentration for arsenic in soils" at MGP sites was 27.5mg/kg with an upper 95% limit of 31.5mg/kg.

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During the Concordia site investigation activities completed by Burns & McDonnell in September 2003, several soil samples were collected on site and analyzed for arsenic. These results were submitted to KDHE in ONEOK's "Final Site Investigation Report For Interim Removal Action Investigation, former Manufactured Gas Plant, Concordia, Kansas". A total of fifteen samples were analyzed for arsenic and results ranged from 2.8mg/kg to 4.5mg/kg with an average value of 3.55mg/kg. These results indicate that arsenic in soils at the Concordia site are generally an "order of magnitude below" the typical arsenic levels reported by EPRI for MGP sites.

It is further also noted that during the period of gas manufacturing, coal storage at the MGP was on the east side of the operation (see Sanborn Maps for 1917 and 1927) in an area located between monitoring wells CMW-01 and CMW-02. These Sanborn maps also indicate that coal storage was inside a building, thus minimizing potential leaching of metals from the coal storage pile. Based on the above data it is unlikely that the arsenic level observed at monitoring well CMW-05 is the result of MGP activities. If the elevated arsenic levels were attributable to the coal feedstock, the highest arsenic levels should be expected at monitoring well CMW-01.

GROUNDWATER GRADIENT

Based on water level measurements from site piezometers installed prior to monitoring wells and four groundwater sampling events at the site, the groundwater gradient is very flat and has shown relatively little variation over time. Gradient has ranged from 0.005 ft/ft to 0.009 ft/ft with the general flow direction slightly to the north-northwest. Water levels have varied by as much as 2.5 feet to 3 feet over the monitoring period of approximately seven years; however, the gradient has remained consistently flat during that period.

SUMMARY AND CONCLUSIONS

Based on data generated from the Concordia MGP site and research completed on behalf of ONEOK, the following present our current understanding relative to groundwater conditions at the site:

- Remediation at the site was completed by removal of impacted soils during 2008 and KDHE provided ONEOK a "No Further Remediation of Soils" letter dated January 12, 2010.
- Three of the five monitoring wells installed at the site are not within the foot-print of the MGP operations and one well (CMW-05) is located within the City of Concordia street right-of-way. The two western most wells (CMW-03 & CMW-04) are on the

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current owner's property but are located within the vacated Republican Street right-of-way, approximately a hundred feet west of the MGP facilities.


- Four rounds of groundwater sampling and analysis show that the only potential groundwater issue is the elevated level of arsenic at monitoring well location CMW-05 (0.021mg/L) at the northern edge of the site within the Mill Street right-of-way.
- Arsenic levels in groundwater from the four wells located at the corners of the current property (CMW-01, CMW-02, CMW-03 and CMW-04) are below both the Residential and Non-Residential RSK values.
- The arsenic level at well CMW-05 has decreased slightly over time and is not significantly greater than the Residential and Non-Residential Groundwater RSK value of 0.01mg/L.
- The MGP coal storage area that potentially could have contributed to arsenic in groundwater was located on the east side of the site between monitoring wells CMW-01 and CMW-02.
- Eleven groundwater background samples analyzed for arsenic resulted in determination of an average background arsenic level of 0.0036mg/L with a 95% tolerance limit of 0.0075mg/L and a 99% tolerance limit of 0.0106mg/L.
- Arsenic background levels for groundwater are below the RSK level but are higher than arsenic levels in four of the five wells installed for the Concordia groundwater study.
- Arsenic levels for on-site soils are significantly below published data levels for arsenic at MGP sites and are not believed to be a significant contributor to arsenic levels in groundwater.
- Groundwater gradient at the site is very flat and has shown relatively little change in direction or gradient even though water levels have varied by more than two feet over time.

ONEOK has demonstrated through both site investigation activities and groundwater sampling and analysis that there is no groundwater contamination above Residential or Non-Residential RSK values within the MGP operating foot print and that arsenic soil levels on the site are below published averages for MGP sites. Therefore, ONEOK is requesting KDHE to provide a letter of closure for the Concordia MGP site.

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If you have any questions or require more information please contact me at (636) 273-5660 or Mr. Alan Kettle at 785-431-4258.

Sincerely,



James E. Gould, P.E.
Senior Project Manager
Burns & McDonnell

cc: Alan Kettle
Jim Haught
Joe Miller
Matt Cox

Table

Table 1
Calculation of Tolerance Limit for Background Arsenic
Concordia MGP Site

Equation:

$$TL = x + \kappa(n, \gamma, 1 - \alpha) \times s$$

Where:

TL = Tolerance Limit [milligrams per liter (mg/L)]

x = Mean of background concentrations (mg/L)

$\kappa(n, \gamma, 1 - \alpha)$ = One-sided normal tolerance factor, USEPA 2009

s = Standard deviation

Variable Values:

TL = Calculated

x = Calculated

$\kappa(n, \gamma, 1 - \alpha)$ = 2.815 (USEPA, 2009) 95% Confidence, 95% Coverage

s = Calculated

Chemical	x (mg/L)	s (mg/L)	TL (mg/L)
Inorganic Compounds			
Arsenic, dissolved	0.0036	0.0014	0.0075

Table 1
Calculation of Tolerance Limit for Background Arsenic
Concordia MGP Site

Equation:

$$TL = x + \kappa(n, \gamma, 1 - \alpha) \times s$$

Where:

TL = Tolerance Limit [milligrams per liter (mg/L)]
x = Mean of background concentrations (mg/L)
 $\kappa(n, \gamma, 1 - \alpha)$ = One-sided normal tolerance factor, USEPA 2009
s = Standard deviation

Variable Values:

TL = Calculated
x = Calculated
 $\kappa(n, \gamma, 1 - \alpha)$ = 4.829 (USEPA, 2009) 99% Confidence, 99% Coverage
s = Calculated

Chemical	x (mg/L)	s (mg/L)	TL (mg/L)
Inorganic Compounds			
Arsenic, dissolved	0.0036	0.0014	0.0106

Figure



LEGEND:

⊕ ARSENIC BACKGROUND SAMPLE LOCATION

**Burns &
McDonnell**
SINCE 1898

Figure 1

**ARSENIC BACKGROUND
SAMPLE LOCATIONS
FORMER MGP SITE
CONCORDIA, KANSAS**

Attachment A
Laboratory Analytical Data



12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

Matt Cox
Burns & McDonnell - KS
9400 Ward Parkway
Kansas City, MO 64114

Report Summary

Thursday August 18, 2011

Report Number: L530820

Samples Received: 08/12/11

Client Project: 58901-3.20.30

Description: KGS Concordia MGP Site

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Tom Mellette, ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - I-2327, CT - PH-0197, FL - E87487
GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704, ND - R-140
NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 00109, WV - 233
AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032008A,
TX - T104704245, OK-9915

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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REPORT OF ANALYSIS

August 18, 2011

Matt Cox
Burns & McDonnell - KS
9400 Ward Parkway
Kansas City, MO 64114

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-01
Collected By : J. E. Gould
Collection Date : 08/09/11 08:30

ESC Sample # : L530820-01
Site ID :
Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0037	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit (PQL)
Note:
The reported analytical results relate only to the sample submitted.
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REPORT OF ANALYSIS

August 18, 2011

Matt Cox
Burns & McDonnell - KS
9400 Ward Parkway
Kansas City, MO 64114

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-02
Collected By : J. E. Gould
Collection Date : 08/09/11 08:50

ESC Sample # : L530820-02

Site ID :

Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0048	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

Note:

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REPORT OF ANALYSIS

Matt Cox
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9400 Ward Parkway
Kansas City, MO 64114

August 18, 2011

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-03
Collected By : J. E. Gould
Collection Date : 08/09/11 09:42

ESC Sample # : L530820-03
Site ID :
Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0031	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	1.1	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

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Matt Cox
Burns & McDonnell - KS
9400 Ward Parkway
Kansas City, MO 64114

August 18, 2011

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-04
Collected By : J. E. Gould
Collection Date : 08/09/11 10:03

ESC Sample # : L530820-04

Site ID :

Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0062	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	1.0	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

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REPORT OF ANALYSIS

August 18, 2011

Matt Cox
Burns & McDonnell - KS
9400 Ward Parkway
Kansas City, MO 64114

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-05
Collected By : J. E. Gould
Collection Date : 08/09/11 11:13

ESC Sample # : L530820-05

Site ID :

Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0020	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	0.21	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

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9400 Ward Parkway
Kansas City, MO 64114

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-06
Collected By : J. E. Gould
Collection Date : 08/09/11 11:40

ESC Sample # : L530820-06
Site ID :
Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0030	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

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Kansas City, MO 64114

August 18, 2011

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-07
Collected By : J. E. Gould
Collection Date : 08/09/11 12:31

ESC Sample # : L530820-07

Site ID :

Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0034	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

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9400 Ward Parkway
Kansas City, MO 64114

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-08
Collected By : J. E. Gould
Collection Date : 08/09/11 12:42

ESC Sample # : L530820-08

Site ID :

Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0023	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit(PQL)

Note:

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Kansas City, MO 64114

August 18, 2011

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-09
Collected By : J. E. Gould
Collection Date : 08/09/11 13:53

ESC Sample # : L530820-09
Site ID :
Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0021	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

Note:

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9400 Ward Parkway
Kansas City, MO 64114

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-10
Collected By : J. E. Gould
Collection Date : 08/09/11 15:15

ESC Sample # : L530820-10
Site ID :
Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0031	0.0010	mg/l	6020	08/16/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

Note:

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9400 Ward Parkway
Kansas City, MO 64114

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-11
Collected By : J. E. Gould
Collection Date : 08/09/11 15:37

ESC Sample # : L530820-11

Site ID :

Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Arsenic, Dissolved	0.0059	0.0010	mg/l	6020	08/18/11	1
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

Note:

The reported analytical results relate only to the sample submitted.

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Reported: 08/18/11 12:33 Printed: 08/18/11 14:45



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REPORT OF ANALYSIS

Matt Cox
Burns & McDonnell - KS
9400 Ward Parkway
Kansas City, MO 64114

August 18, 2011

Date Received : August 12, 2011
Description : KGS Concordia MGP Site
Sample ID : CBG-12
Collected By : J. E. Gould
Collection Date : 08/09/11 16:14

ESC Sample # : L530820-12

Site ID :

Project # : 58901-3.20.30

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Iron, Dissolved	BDL	0.10	mg/l	6010B	08/14/11	1

BDL - Below Detection Limit

Det. Limit - Practical Quantitation Limit (PQL)

Note:

The reported analytical results relate only to the sample submitted.

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Reported: 08/18/11 12:33 Printed: 08/18/11 14:45

Summary of Remarks For Samples Printed
08/18/11 at 14:45:13

TSR Signing Reports: 690
R5 - Desired TAT

Sample: L530820-01 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-02 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-03 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-04 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-05 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-06 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-07 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-08 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-09 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-10 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-11 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15
Sample: L530820-12 Account: BURNMCKC Received: 08/12/11 10:45 Due Date: 08/19/11 00:00 RPT Date: 08/18/11 12:33
Field Filtered. Changed ASDICP to ASDG per TM. AV 8/15



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Quality Assurance Report
 Level II

L530820

August 18, 2011

Analyte	Result	Laboratory Blank Units	% Rec	Limit	Batch	Date Analyzed
Iron, Dissolved	< .1	mg/l			WG550450	08/14/11 15:29
Arsenic, Dissolved	< .001	mg/l			WG550634	08/16/11 19:59
Arsenic, Dissolved	< .001	mg/l			WG551001	08/18/11 08:51

Analyte	Units	Result	Duplicate Duplicate	RPD	Limit	Ref Samp	Batch
Iron, Dissolved	mg/l	0	0	0	20	L530820-12	WG550450
Arsenic, Dissolved	mg/l	0.00320	0.00310	3.49	20	L530820-10	WG550634
Arsenic, Dissolved	mg/l	0.00560	0.00590	4.33	20	L530820-11	WG551001

Analyte	Units	Laboratory Control Known Val	Sample Result	% Rec	Limit	Batch
Iron, Dissolved	mg/l	1.13	1.15	102.	85-115	WG550450
Arsenic, Dissolved	mg/l	.0567	0.0505	89.1	85-115	WG550634
Arsenic, Dissolved	mg/l	.0567	0.0584	103.	85-115	WG551001

Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Iron, Dissolved	mg/l	1.17	0	1.13	104.	75-125	L530820-12	WG550450
Arsenic, Dissolved	mg/l	0.0565	0.00310	.0567	94.2	75-125	L530820-10	WG550634
Arsenic, Dissolved	mg/l	0.0664	0.00590	.0567	107.	75-125	L530820-11	WG551001

Analyte	Units	MSD	Matrix Spike Ref	Duplicate %Rec	Limit	RPD	Limit	Ref Samp	Batch
Iron, Dissolved	mg/l	1.15	1.17	102.	75-125	1.72	20	L530820-12	WG550450
Arsenic, Dissolved	mg/l	0.0557	0.0565	92.8	75-125	1.43	20	L530820-10	WG550634
Arsenic, Dissolved	mg/l	0.0671	0.0664	108.	75-125	1.05	20	L530820-11	WG551001

Batch number / Run number / Sample number cross reference

WG550450: R1813753 R1813754: L530820-02 03 04 05 06 07 08 09 10 11 12 01
 WG550634: R1817110: L530820-01 02 03 04 05 06 07 08 09 10
 WG551001: R1818690: L530820-11

* * Calculations are performed prior to rounding of reported values.

* Performance of this Analyte is outside of established criteria.

For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'



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Quality Assurance Report
Level II

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The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.